Claims

We claim:

1. A method for controlling a mechanical arm, the method comprising:

planning a desired path of a mechanical arm;

measuring an actual path segment of the actual path of mechanical arm;

determining an error between the measured actual path segment and the planned desired path; and

applying a corrective force to the mechanical arm based on the determined error to conform to the desired path.

2. The method according to claim 1 wherein corrective force comprises an orthogonal corrective vector orthogonal to a progress vector of the mechanical arm consistent with the actual path segment.

3. The method according to claim 1 wherein the corrective force comprises an orthogonal corrective vector and a progress vector, the orthogonal vector orthogonal to a progress direction of the mechanical arm and the progress vector consistent with the actual path segment of the mechanical arm.

4. The method according to claim 1 wherein the applying divides hydraulic flow between a first actuator and a second actuator, the first actuator associated with an orthogonal corrective vector and a second actuator associated with a progress vector consistent with the actual path segment, each actuator including at least one hydraulic controller for controlling a hydraulic member associated with the mechanical arm.

5. The method according to claim 1 wherein the desired path is stored in a data storage device for reference, and wherein the desired path is selected based on the mechanical arm encountering an obstruction in the actual path.

6. The method according to claim 1 wherein the actual path segment is determined by translating position versus time measurements at one or more joints of the mechanical arm to a reference point associated with the mechanical arm.

7. The method according to claim 1 wherein the determining of the error represents determining a deviation between desired velocity vectors associated with the desired path and actual velocity vectors associated with the actual path segment.

8. The method according to claim 1 wherein the applying comprises:

converting the determined error into hydraulic flow rates applicable to at least one joint of the mechanical arm for the desired corrective force; and

providing a control signal to at least one actuator to achieve the determined hydraulic flow rates for at least one hydraulic member associated with a corresponding joint of the mechanical arm.

9. The method according to claim 1 further comprising:

providing an error feedback for correction of the hydraulic flow rate of the at least one joint.

10. The method according to claim 1 further comprising:

providing an error feedback for correction of the control signal to the at least one actuator.

11. A system for controlling a mechanical arm, the system comprising:

a storage device for storing a desired path of a mechanical arm;

a position sensor for measuring an actual path segment of an actual path of the mechanical arm;

an error determination module for determining an error between the measured actual path segment and the desired path; and

a path correction module for applying a corrective force to the mechanical arm based on the determined error to conform to the desired path.

12. The system according to claim 11 wherein corrective force comprises an orthogonal corrective vector being generally orthogonal to a progress vector of the mechanical arm consistent with the actual path segment.

13. The system according to claim 11 wherein the corrective force comprises an orthogonal corrective vector and a progress vector, the orthogonal vector being generally orthogonal to a progress direction of the mechanical arm and the progress vector consistent with actual path segment of the mechanical arm.

14. The system according to claim 11 further comprising:

a first actuator comprising a first hydraulic controller and a first hydraulic member, the first hydraulic controller arranged for controlling the first hydraulic

member associated with the mechanical arm;

a second actuator comprising a second hydraulic controller and a second hydraulic member, the second hydraulic controller arranged for controlling the second hydraulic member associated with the mechanical arm; and

the path correction module dividing hydraulic flow between the first actuator and the second actuator, the first actuator associated with an orthogonal corrective vector and a second actuator associated with a progress vector consistent with the actual path segment.

15. The system according to claim 11 wherein the desired path is selected based on the closest approximation between operator input to the desired path and a library of available desired paths.

16. The system according to claim 11 wherein the desired path is stored in a data storage device for reference, and wherein the desired path is selected based on the mechanical arm encountering an obstruction in the actual path.

17. The system according to claim 11 wherein the actual path segment is determined by position versus time measurements at one or more joints of the mechanical arm.

18. The system according to claim 11 wherein the error determination module determines a deviation between desired velocity vectors associated with the desired path and actual velocity vectors associated with the actual path segment.

19. The system according to claim 11 further comprising:

a hydraulic member for moving a corresponding joint of the mechanical arm;

the path correction module arranged to apply a hydraulic flow rate applicable to the hydraulic member for the desired corrective force, the path correction module providing a control signal to at least one actuator to achieve the determined hydraulic flow rate.

20. The system according to claim 11 further comprising a servo-valve controller for controlling a hydraulic member for moving a corresponding joint of the mechanical arm, the servo-valve controller providing error feedback for correction of the hydraulic flow rate of the hydraulic member.

21. The system according to claim 11 wherein the path correction module provides an error feedback for correction of the control signal to at least one actuator.

22. The system according to claim 11 further comprising a target planning module for planning the planned path.